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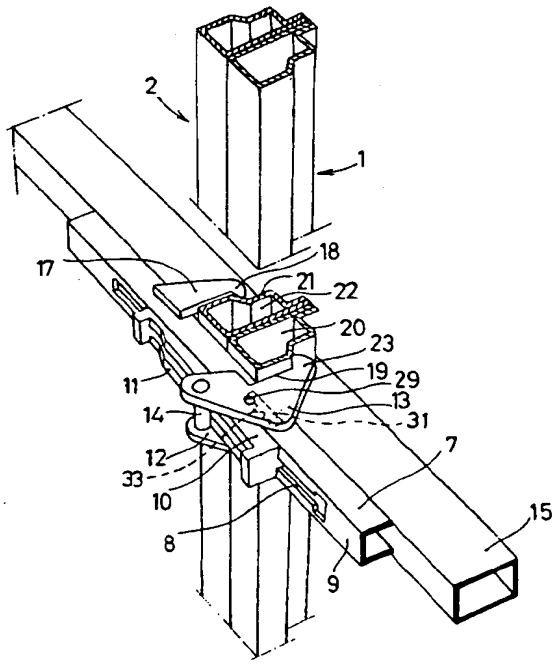
(54) Device for the quick clamping of panels for forming concrete structures.

(57) The device comprises a tubular element with U cross-section (7) which is adapted to lay on respective transverse beams (3,4) of two adjacent forming panels (1,2) to be attached together, having such tubular element a lengthwise slit (8) in the face opposed to said beams of the panels, in which slit a wedge structure (10) may slide, which wedge structure shows two slanted successive active surfaces, for the engagement of an uper transverse bolt (14) of a swingeable structure constituted by two parallel plates (12,13) connected by such upper bolt (14) and a second intermediate bolt (29), which swingeable structure embraces one of the beams (3,4) corresponding to one of the adjacent panels to be attached, engaging such parallel plates by its ends on slanted sections of a beam constituting the frame of said panel, whereas the beam constituting the frame of the opposed panel to be attached will be engaged by means of plates (17) which are integral with said tubular element (7) having U cross-section.

FIG. 3



EP 0 537 403 A1

The present invention refers to a device for the quick and removable clamping of flat panels for forming concrete structures. The device brings many advantages on the heretofore known techniques and allows a substantial stiffening of the forming structures.

Usually the fabrication of concrete forming structures needs, for time-saving, the composition of substantially sized forming surfaces which for practical reasons must be built up starting from modular panels of smaller dimensions.

To this end, the bigger surfaces are built up on the construction sites by the assembly of a number of smaller modular panels. The bigger forming surfaces or formworks are afterwards positioned in the appropriate place by means of a crane.

The attachment fixtures used for this end need from one side to obtain the maximum stiffness of the attached panel and in the other hand, it is convenient that the assembly process be fast and easy to carry out in order to obtain the best manpower economy.

At present, some devices are known for the mutual attachment of concrete forming panels which rely on conventional, traditionally known attachment fixtures such as those commercially known having two jaws or clamping members which grip the elements which have to be attached and with driving means made out of an helical screw. These are tools of universal type widely used in building and in other branches of engineering.

Other attachment devices are known, which are to be considered as particular embodiments of the above mentioned attachment means, in which the gripping mutually opposed jaws have profiles to be more or less adapted to the beams of the panels to be attached and which tensioning is carried out aswell by means of an helical screw and lugged nots to be manually operated.

It is felt, therefore, the need in this branch of engineering of having devices for the quick clamping of concrete forming panels not having to resort to helical screws and which assembly and disassembly could be made in a faster and easier way than with the known tensioning devices, guaranteeing at the same time, with a simplified operation, a high force to maintain the panel in its assembly position.

The objective of this invention is obtained by means of the device which constitutes the subject of the present Patent Application, which allows a very fast and easy assembly and disassembly of the forming panels, insuring as well a high stiffness of the assembly. The device features simple wedge means which can be very easily operated and which allow, given their special design, an easy and safe handling of the device, preventing a high rate of wear of the same.

Basically, the device of the present invention comprises a support which has a cross-section in the form of an inverted U or rectangular tube having a lengthwise slit in which a wedge structure is assembled with capacity to move along the slit which guides the wedge structure in its movement. Said wedge structure is capable of exerting pressure on an intermediate bridge which connects to parallel plates constituting a swivelling body in which said parallel plates are attached by means of two transverse bolts. Said parallel plates have end sections having recesses which are capable of mating together with a part of the cross-section of the beams constituting the lateral frames of two adjacent forming panels to be attached.

In the device according to the invention the attachment of a forming panel to the adjacent panel to constitute a bigger forming structure is obtained by the displacement of the wedge structure by percusion. The wedge structure moves on the guiding slit exerting an effort on the swingeable structure which adapts with a high force against the beams constituting the frame of the panel to be attached, pushing such panel against the adjacent panel which is clamped by means of plates which are integral with the device.

The operation of the swingeable structure, specially concerning the guiding and fastening of the same, said swingeable structure consisting of the two parallel plates connected by transverse bolts, will be complemented and improved by the arrangement of elongated openings on the side surfaces of the rectangular tubular member of the device. Said lateral openings receive one of the transverse bolts of the swingeable structure, and they feature on its upper border multiple ondulations or saw teeth formations or protusions of any other having sides which show a certain inclination, on which inclined sides said transverse bolt will act when tensioned by means of the wedge structure. In this way an additional vector will be created which has the tendency to close the clamping device, assisting at the same time in the location of the swingeable structure in the adequate place depending on the effective tensioning width which is determined in its turn by the precise dimensions, specially the cross-section, of the beams constituting the frames of the panels to be attached.

For its best understanding, the invention will be explained making reference to particular embodiments, to be considered as non-limitative examples.

Figures 1 and 2 correspond respectively to an upper view of two mutually attached concrete forming panels and to a cross-section through II-II of figure 1.

Figure 3 shows a pictorial view of a clamping device according to the present invention.

Figure 4 corresponds to a cross-section of the clamping device, shown to attach two concrete forming panels.

Figure 5 is an upper view corresponding to figure 4.

Figure 6 and 7 show cross-sections of the clamping device through planes VI-VI and VII-VII shown in figure 4.

Figures 8 and 9 show corresponding views of the lateral elongated openings of the U support which receives one of the transverse bolts of the swingeable structure.

Figures 10 and 11 show two examples of eventual embodiments of the cross-sections of the beams constituting the frames for the forming panels.

Figures 12, 13, 14 and 15 show respective successive tensioning steps of the swingeable structure of the clamping device of the present invention, starting from the loosened initial position, going through the stage in which the swingeable structure climbs on the steeper part of the wedge, up to the tensioning stage which corresponds to the section in which the wedge structure shows a lower inclination, ending in the final attachment position.

Figure 16 shows the relative positions occupied by the two transverse bolts of the swingeable structure in relation with the lateral edges of the protrusion formed in the lateral openings of the rectangular support and the relative position of the effort bearing section on the frame forming beam, showing the vectors corresponding to the intervening forces.

As shown in the drawings, two adjacent concrete forming panels 1 and 2 are positioned adjacent to each other, on perimetral beams -3- and -4- constituting a part of the frames of such panels, attached by clamping means, in a variable number, as those shown with reference numerals -5- and -6- in figure 1.

As shown in figure 3, the clamping device according to the present invention essentially comprises a U section beam -7- which has a straight slit -8-extending lengthwise on one of the faces -9- of the beam and which is capable of receiving a movable wedge structure -10- to be guided on said slit and which has an upper face -11- with two successive inclined surfaces. The device will be completed by means of a swingeable structure which comprises two symetrically arranged side plates -12- and -13- which are attached by means of bolts -14- and -29-. The swingeable structure may rotate on said bolts and it is arranged in a form that the side plates will embrace the side faces of the U element - 7- and at the same time the corresponding side faces of beam -15- of one of the panels -1- to be attached.

The clamping device has at the same time two side plates such as -17-, figure 3, integral with the lateral faces of beam -7-, having end hooks -18- which may adapt to side beam -22- of one of the panels -2- to be attached.

Site plates -12- and -13- have intermediate recesses -19- which shape allows the mating, with a certain play, with the perimetral beam -20- of forming panel -1- to be attached. At the same time, the ends -18-of plate -17- are capable of entering into recesses -21-of beam -22- of the other adjacent panel -2 to be attached.

By this arrangement, as shown in figure 3, the tensioning of the wedge shape structure -10- along its guide -8- will be transformed in upward and downward displacements for the swingeable structure, which side plates -12- and -13- will be retained by a wedge action as shown in figure 4, so that the nose expansion -23- will contact shoulder -24- of beam -20-, with generation of a main effort as shown by vector -25- which decomposes in a component -26- a second component -27-. By reaction, a wedge effect will be generated between the inclined section -24'- of beam -22- and the end -18- of plate -17-integral with support -7-, generating an effort shown by vector -25'- which, in its turn, decompose in a component -27'- and the second component -26'-.

Component forces -27- and -27' - compress adjacent panels -1- and -2- together and component forces -26- and -26'-compress said panels against the support -7-, stiffening the assembly.

The side elongated openings -31- may adopt the form shown in figure 8, with an ondulated upper edge, or alternatively the form shown in figure 9, which consists of a curved section -30- at one of the ends of the openings of any such form that generally may allow to have an intermediate angled section in such side openings -31-to obtain an additional force which may be represented by a vector directed in the sense of closing the clamping device.

For the composition of larger forming surfaces, a series of forming panels may be assembled together and in case that the overall dimensions of the surface to be composed do not correspond to a multiple of the width of one panel, recourse will be taken to complementary elements to be inserted between said panels.

The ondulated edge -31- in the example of figure 8, shows in its upper border a number of substantially semi-circular recesses and protrusions respectively -33-and -32- so that transverse bolt -29- may lodge itself within any of said recesses -33- depending on the width on which the present clamping device must be used, which will change

according to the width defined by the forming panels and the eventual complementary elements to be used in case that the total width is not a multiple of the width of the individual forming panels.

In the operation of the clamping device, the bolt -29- of the swingeable structure will climb placing itself in the vicinity of one of the recesses -33- of the upper border of the opening. Upon continuation of the driving impacts on the wedge structure of the clamping device, the bolt -29- will lodge itself in one of the recesses -33-and the swingeable structure constituted by elements -12-, -13, -14- and -29- will rotate on bolt -29- compressing its end portion -23- on the ramp -24- of the beam -20-generating a force which has been represented by vector -25- and by effect of the reaction, the same force will be exerted on beam -22- of adjacent plate -2- as previously stated.

As it may be easily understood, according to the dimensions of the complementary elements to be used, the bolt -29- will place itself in the curved section which is closer to its position.

In case that no complementary element will be used, the opening -28- will have only one recess -30- for receiving the bolt -29- as shown in figure 9.

Figures 12, 13, 14, and 15 show some successive stages of the clamping of the device, the first of such figures shows the loose or tensionless situation of the device in which the swingeable structure rests by the transverse bolts -14 and -29- respectively, on the flat end surface of wedge -11- and on lower border of opening -31-.

Upon beginning the displacement of the wedge structure -11- as shown in figure 13, the section which forms a bigger angle shown with reference numeral -34-will induce the first raising of the swingeable structure, the bolt -29- reaching a position close to the upper border which has the recesses -33-. The continuation of the tensioning action by means of wedge structure -11-, will make the bolt -14- to slide on the section with a smaller angle of said wedge structure, reaching the bolt -29- a position which is close to the working section. Subsequently, when the hook or expansion -23- engages the surface -24- of the beam forming part of the frame of the panel, the transverse bolt -29- will engage the slant surface -37- of the protrusion in the border which has an ondulated form, saw teeth structure or any other similar, forming such slanted surface -37- which will give ground to the efforts shown in figure 16, in which is to be appreciated that the force exerted by the wedge structure on bolt -14- will induce a force represented by vector Fo which in the engagement area between expansion -23- and surface -24- will be transformed in a force represented by vector -25- which horizontal component -27- will enhance the closing of the device. Similarly, the engagement action of bolt -29- on slanted surface -27- will produce an effort represented by vector F1, which reaction -35-will act on the swingeable structure, so that its horizontal component represented by vector -36- will operate as well in the sense of closing the swingeable structure, that is, in the sense of tensioning the clamping device. Therefore, the total closing forces to be obtained in the sense of closing the device will be constituted by the addition of both vectors or horizontal components -27- and -36-.

It will be understood that with the arrangement of means provided by this invention, the tensioning and releasing of the clamping device will be made easier and at the same time a high compression force will be obtained on the beams forming the frames of the panel to be attached, this being the guaranty of a higher stability of the clamping device.

It is to be understood as well that in the generation and maintenance of the operative efforts in this clamping device, an important role will be paid by the elastic deformation produced on the elements engaged under the force generated by the wedge structure as this effect will mean the generation of permanent efforts of a magnitude which is equivalent to said elastic deformations.

Claims

1. Device for the quick clamping of panels for forming concrete structures characterized in that it comprises a tubular element with U cross-section which is adapted to lay on respective transverse beams of two adjacent forming panels to be attached together, having such tubular element a lengthwise slit in the face opposed to said beams of the panels, in which slit a wedge structure may slide, which wedge structure shows two slanted successive active surfaces, for the engagement of an uper transverse bolt of a swingeable structure constituted by two parallel plates connected by such upper bolt and a second intermediate bolt, which swingeable structure embraces one of the beams corresponding to one of the adjacent panels to be attached, engaging such parallel plates by its ends on slanted sections of a beam constituting the frame of said panel, whereas the beam constituting the frame of the opposed panel to be attached will be engaged by means of plates which are integral with said tubular element having U cross-section.

2. Device for the quick clamping of flat frames for the forming of concrete structures according to claim 1, characterized in that each of the parallel plates constituting the swingeable struc-

ture has an end hooklike protrusion to engage with the beam constitution the frame of one of the two adjacent panels to be attached, which swingeable structure, by action of the sliding wedge structure, is capable to rotate on one of the two connection bolts, generating an engagement force between said swingeable structure and said beam.

3. Device for the quick clamping of flat frames for the forming of concrete structures according to claim 2, characterized in that the area which receives the compression efforts in the protrusion of the side plates of the swingeable structure and the beam corresponding to the frame of the forming plate, has a certain inclination to generate an effort decomposing in a first component directed towards the opposing panel and a second perpendicular component.

4. Device for the quick clamping of flat frames for the forming of concrete structures according to claim 1, characterized in that the tubular element with U cross-section has two integral plates which protrute towards the side of the tubular element opposed to the guiding slit, ending in corresponding hooklike protrusions which may engage, under a reaction force induced by the wedging action of the swingeable structure on one of the beams of the frame forming part of the adjacent panel in mating section of one of the beams corresponding to the opposed forming panel, to be clamped by the device.

5. Device for the quick clamping of flat frames for the forming of concrete structures according to claim 1, characterized by elongated openings on the lateral surfaces of the tubular element with U cross-section, within which elongated opnenings the intermediate bolt of the swingeable structure may slide, having the upper borders of such openings a number of recesses and protrusions which constitute slanted surfaces aimed at receiving the intermediate bolt when the clamping device is to be tensioned.

6. Device for the quick clamping of flat frames for the forming of concrete structures according to any of the aforegoing claims, characterized in that the elongated openings of the tubular element with U cross-section have its upper borders straight in the majority of its length, showing a unique curved recess in one of its ends.

7. Beams to compose the perimetral frame of forming panels to be attached together by the clamping device according to the aforegoing claims, characterized in that the beams show in cross-section a slanted profile aimed at the engagement with the hooklike protrusions of the plates of the swingeable structures and also with the hooklike protrusions of the plates which are integral with the tubular element with U cross-section.

8. Beams to compose the perimetral frame of forming panels to be attached together by the clamping device according to claim 7, characterized in that the slanted section for the engagement of the hooklike protrusion extends itself in a second slanted outward protruding section.

9. Beams to compose the perimetral frame of forming panels to be attached together by the clamping device according to claim 7, characterized in that the slanted engagement section of the beam extends itself in a vertical section.

FIG. 1

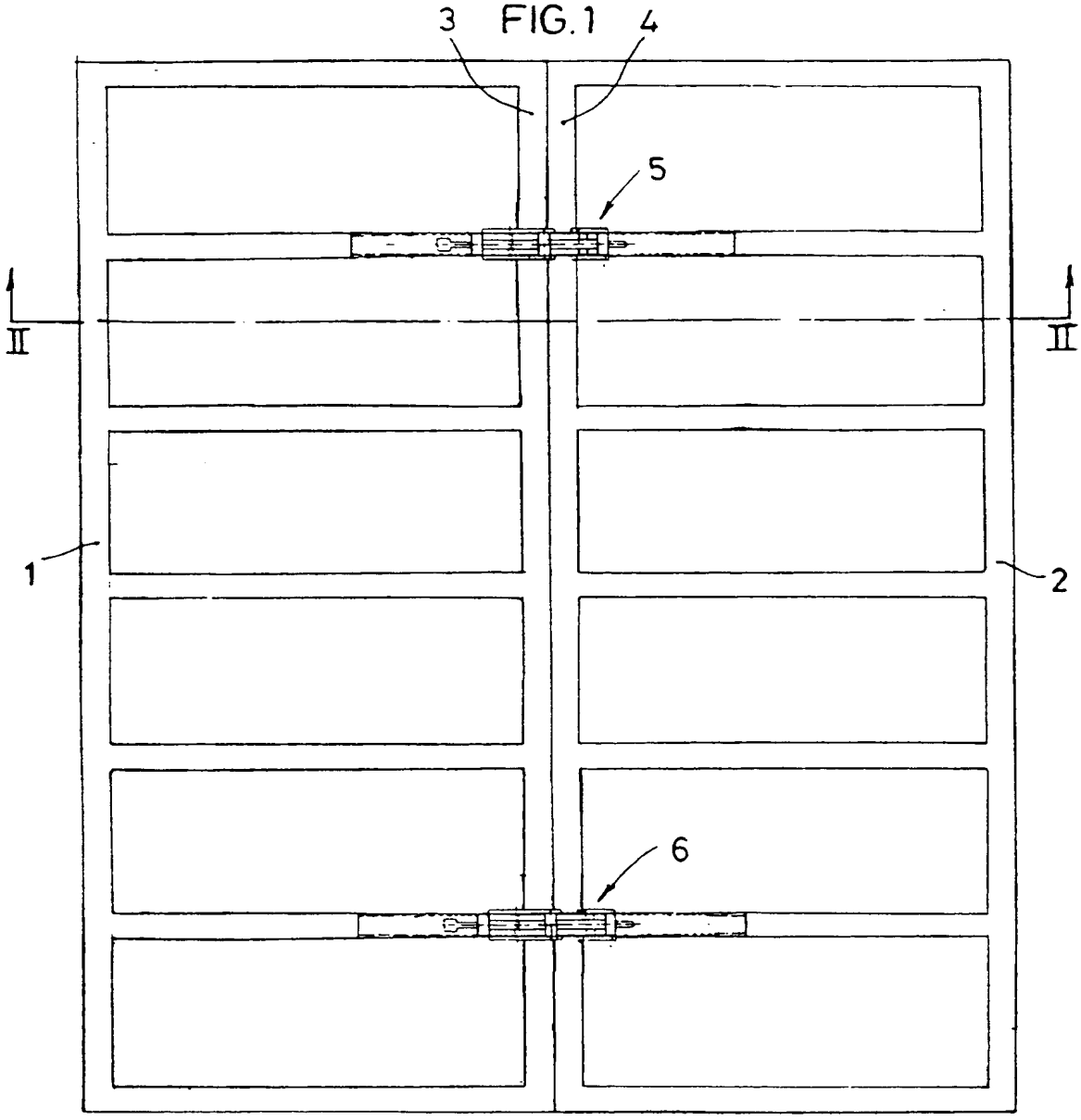


FIG. 2

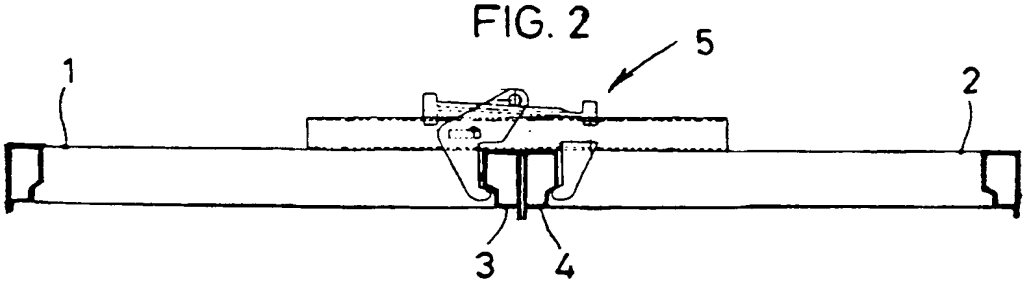


FIG. 3

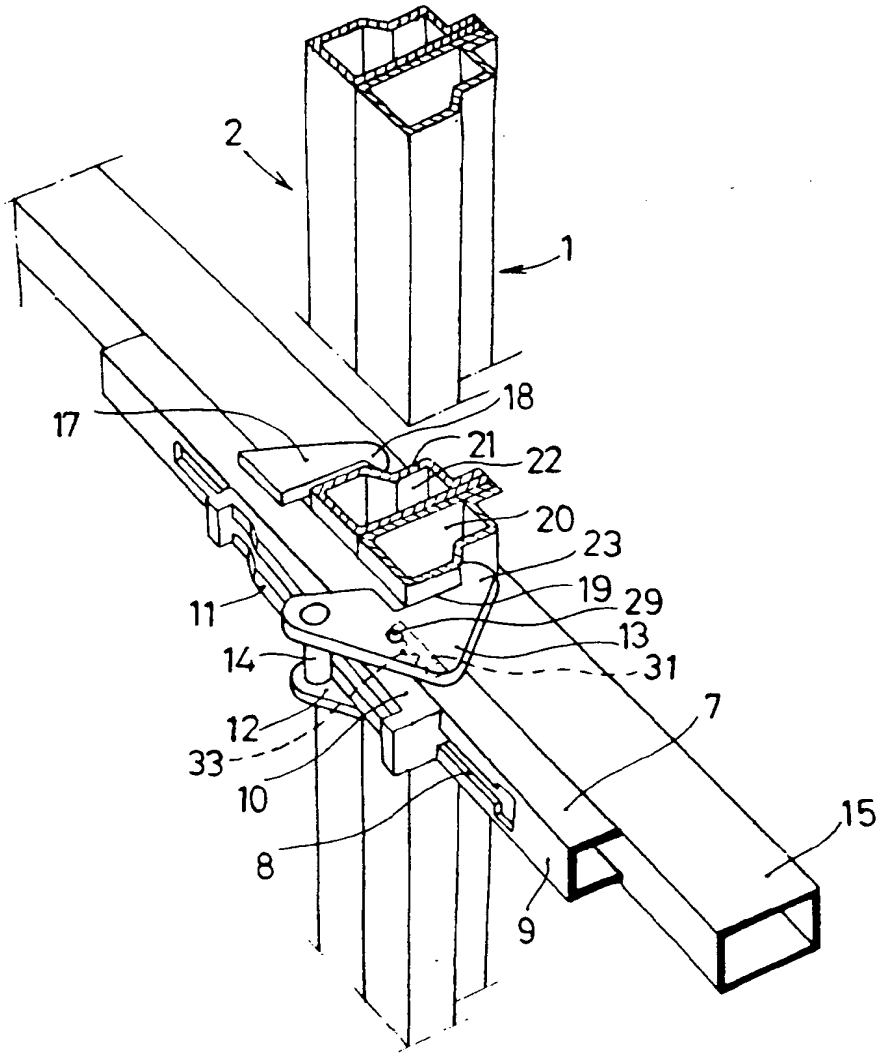


FIG. 4

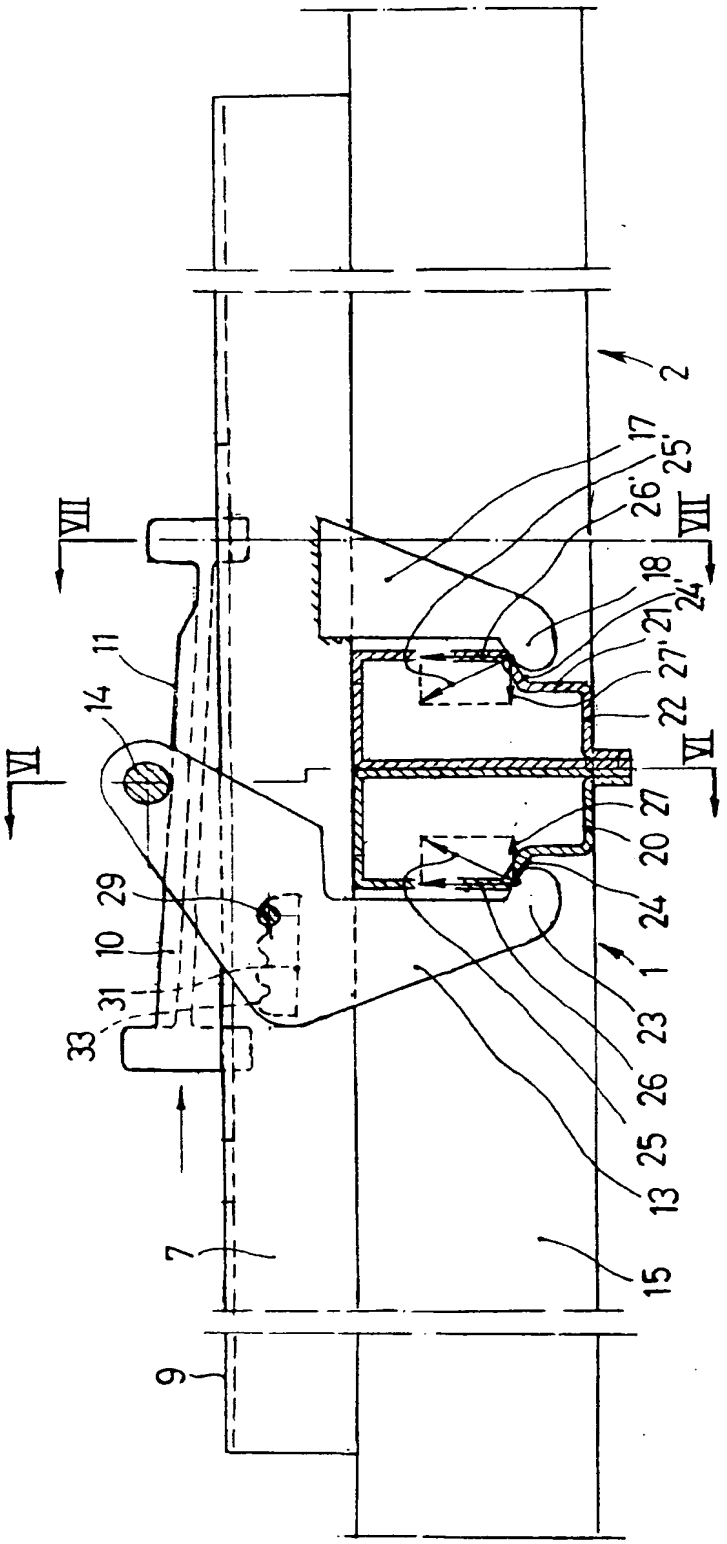


FIG. 5

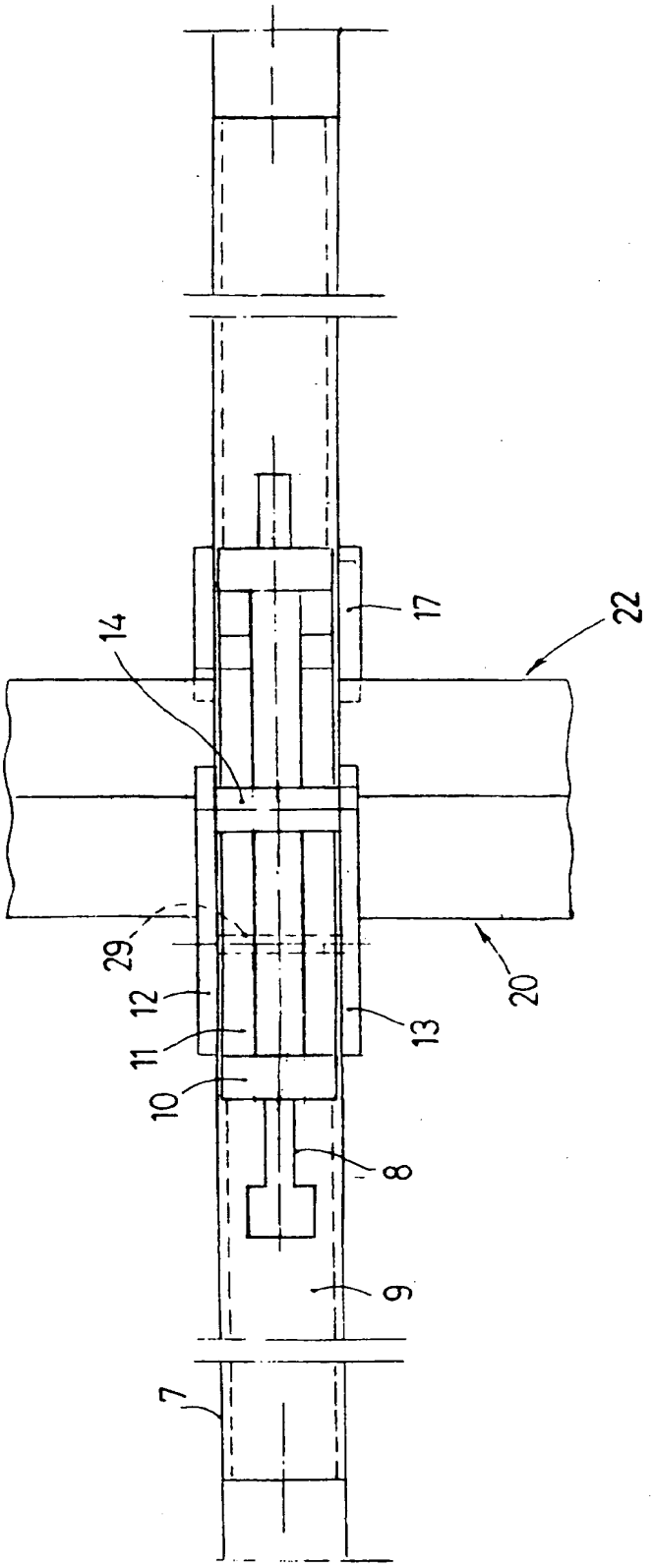


FIG. 6

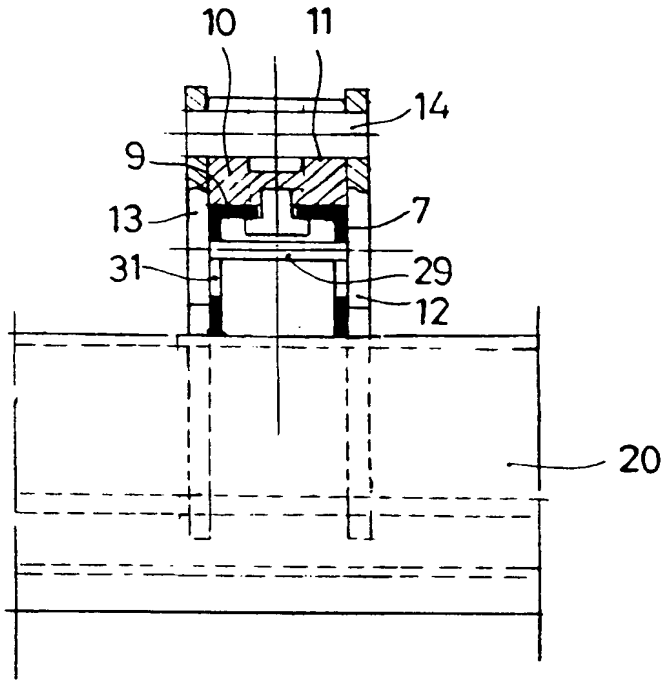


FIG. 7

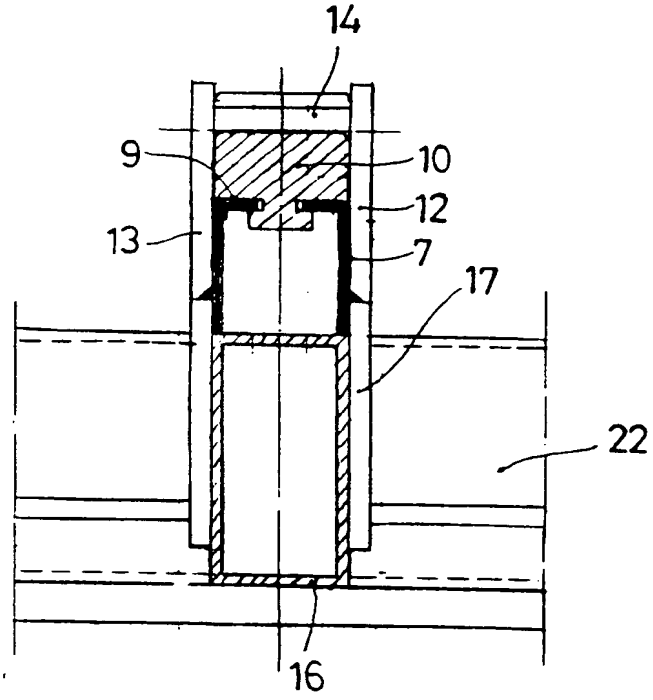


FIG.8

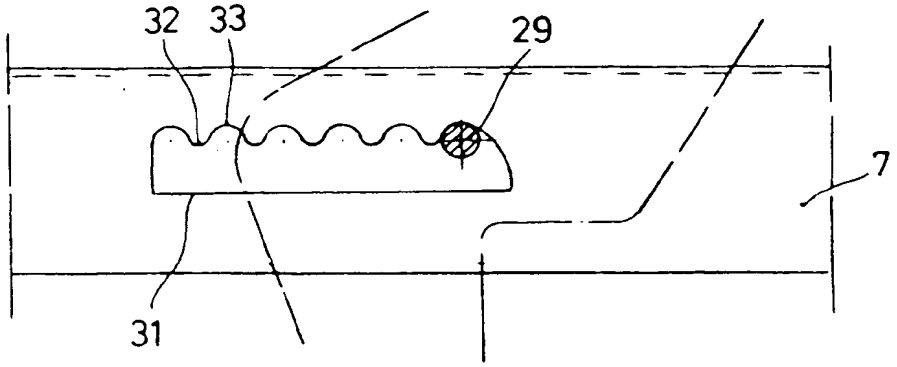


FIG.9

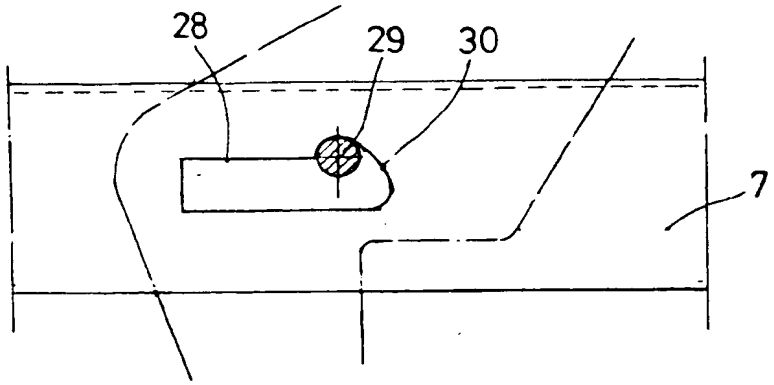


FIG. 10

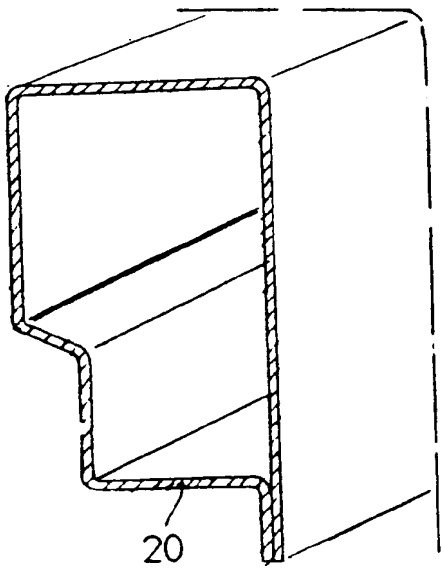


FIG. 11

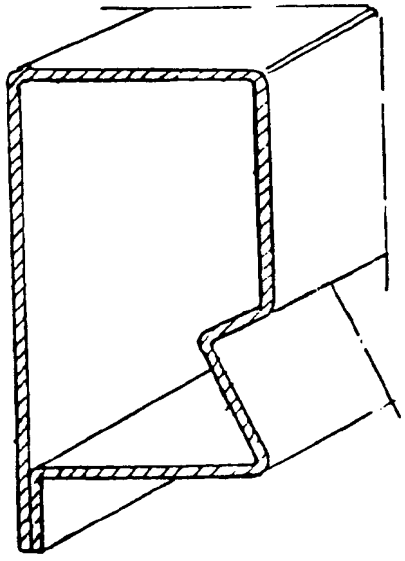


FIG. 12

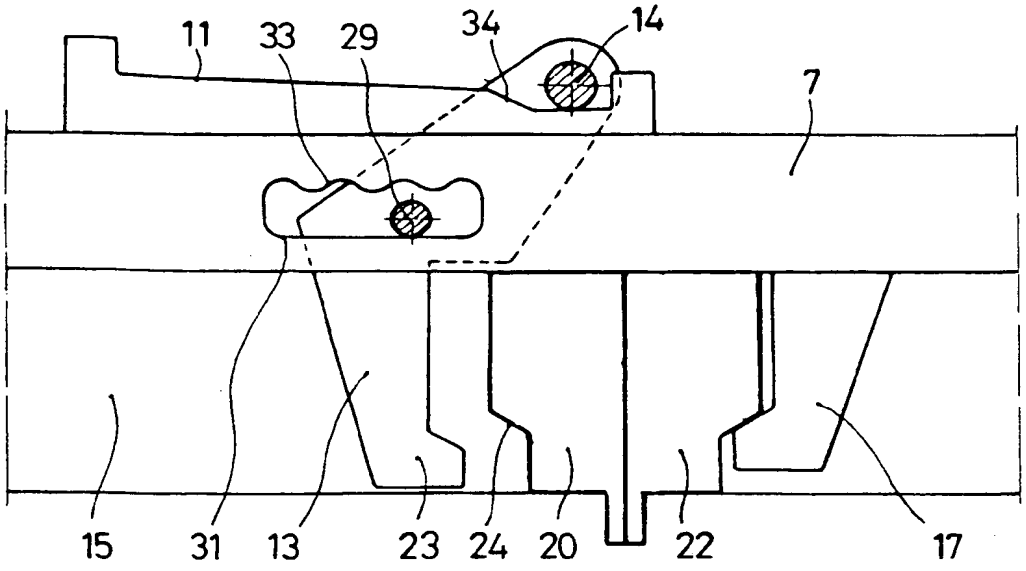


FIG. 13

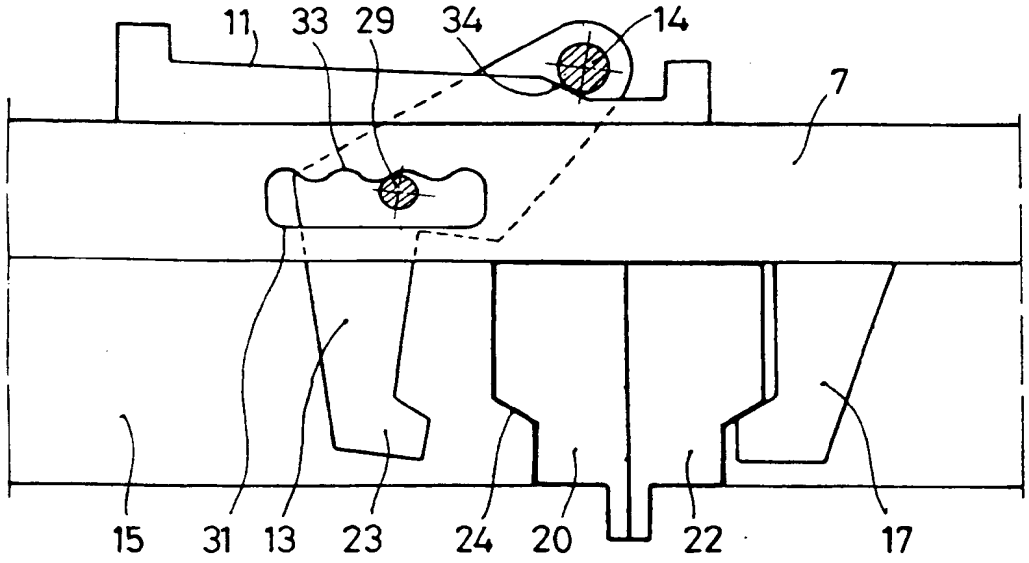


FIG. 14

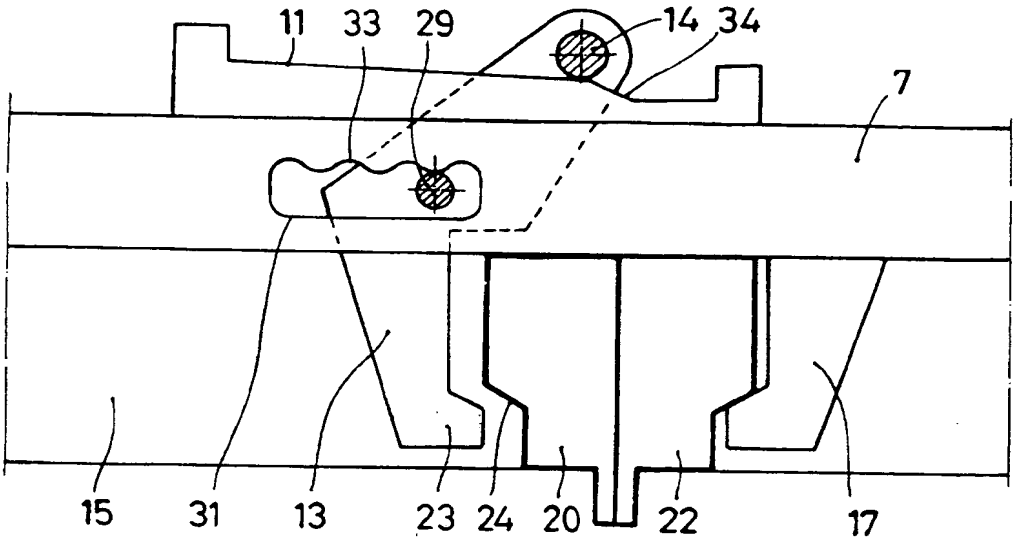


FIG. 15

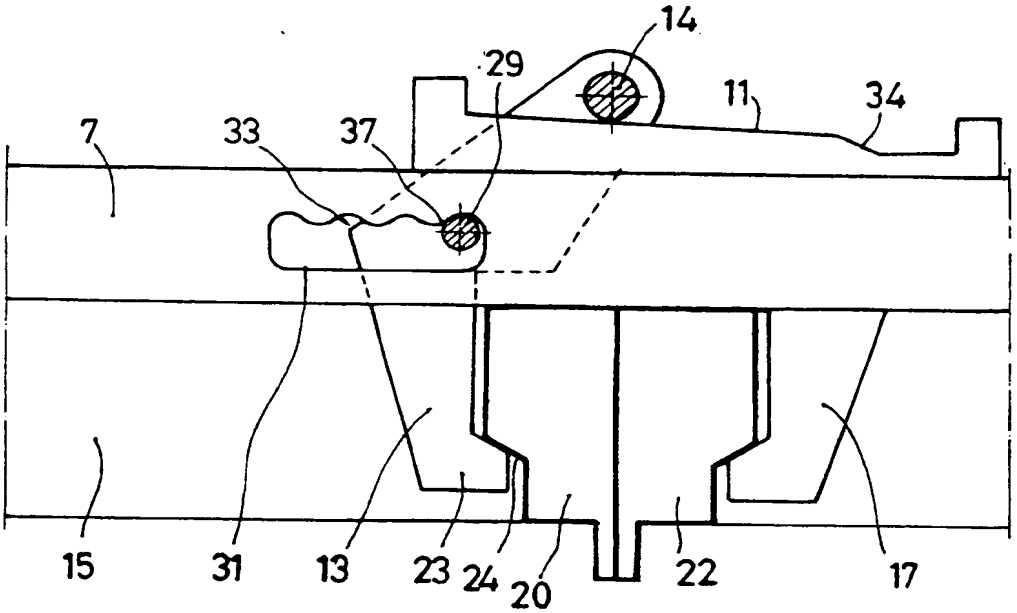
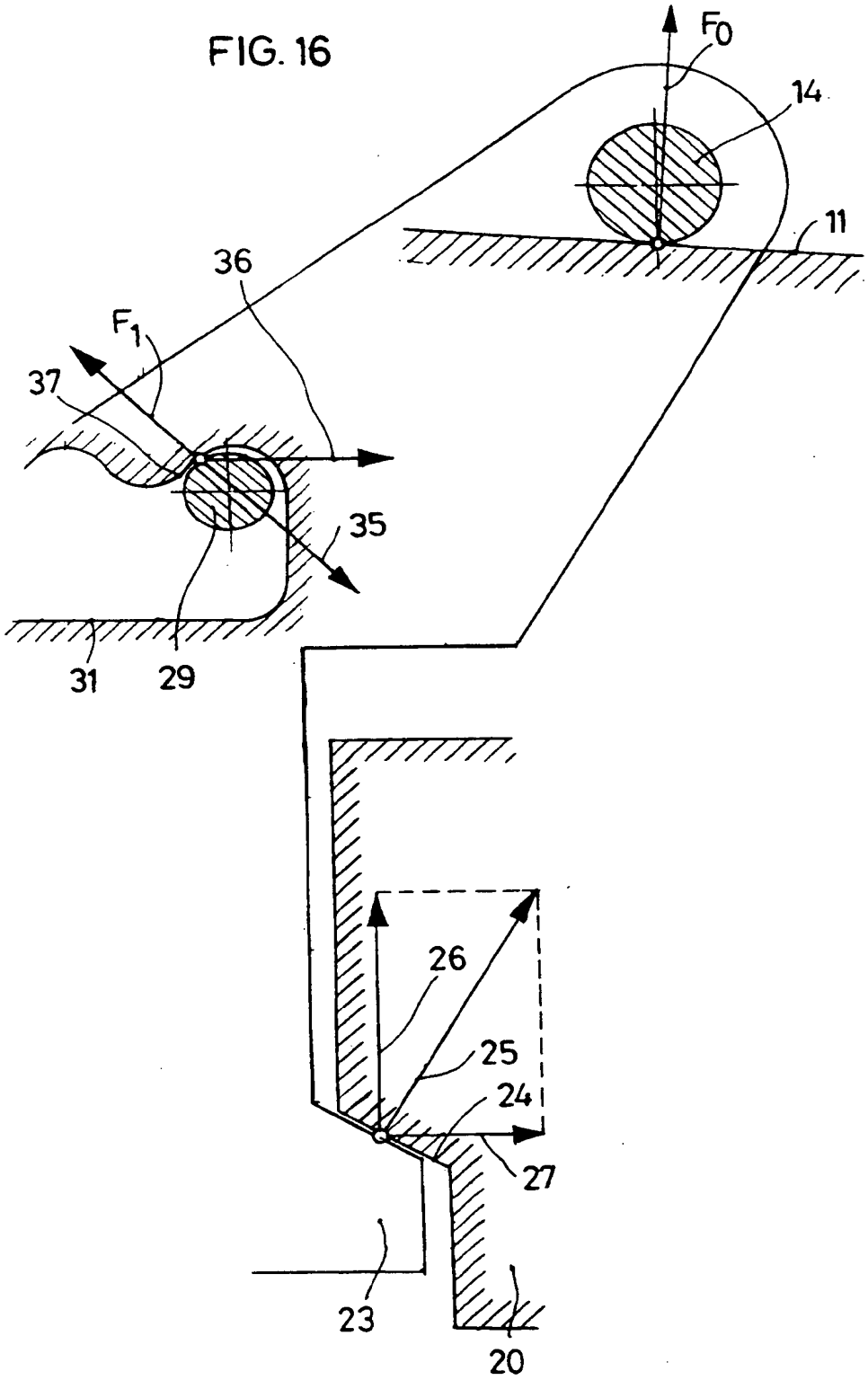


FIG. 16



European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 50 0113

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	DE-A-4 007 950 (HÜNNEBECK - RÖRÖ) * the whole document *	1-7	E04G17/04
X A	EP-A-0 304 950 (HOLLMANN) * column 4, line 44 - column 11, line 55; figures *	1-4 7-9	
X A	EP-A-0 404 198 (HOLLMANN) * column 4, line 49 - column 9, line 50; figures *	1 2-9	
A	EP-A-0 375 969 (HÜNNEBECK - RÖRÖ)		
A	DE-A-3 941 937 (OSTERREICHISCHE DOKA SCHALUNGSTECHNIK)		
A	DE-A-3 609 498 (EMIL STEIDLE)		
A	DE-U-8 622 358 (EMIL STEIDLE)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

E04G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	29 MAY 1992	VIJVERMAN W.C.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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